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| **Texas Commission on Environmental Quality (September 13, 2006) – Chuck Stone** | |
| Sec A <u>Hydrodynamic Modeling</u>:<br>1. It is recommended that the following be discussed briefly at the *beginning* of discussion regarding modeling:<br>a. Specific purpose of the modeling effort (what question is to be answered with model);<br>b. Objectives for modeling relating to its purpose;<br>c. How proposed modeling meets the objective;<br>d. How sampling plan supports the overall modeling effort with the requisite data | 1a. The specific purpose of the modeling is to be able to understand the stability of the in-place sediments within Patrick Bayou under a range of high-flow events.<br>1b. In order to meet the purpose described in 1a, above, the objective of the modeling effort is to develop and calibrate a hydrodynamic model that will simulate circulation in the bayou during high-flow events and provide information on the potential for bed scour. Because high-flow events occur during rainfall events, the hydrodynamic model will be linked to a watershed model that simulates runoff flow quantities from the land surface. As appropriate, point source dischargers will also be incorporated into the models.<br>1c. The proposed hydrodynamic modeling is a well accepted method for simulating circulation in aquatic systems such as Patrick Bayou. In addition, the proposed watershed model is also a well-applied and accepted approach to modeling rainfall-runoff relationships, based on land-use and soil types.<br>1d. The proposed sampling plan will gather information for the modeling effort, including current velocities and flow discharge at different locations in the bayou. These data will be used to calibrate the hydrodynamic and watershed (i.e., rainfall-runoff) models for a range of high-flow events. In addition, the total suspended solids (TSS) concentration data collected during this effort may be used in later phases of the project to calibrate the models of sediment transport in the bayou and solids loading from the watershed. |

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| 2. It is presumed that any analysis of *runoff* to basins associated with "design storms" must also include basin *discharge*. The separate accounting of these parameters should be discussed briefly. | The proposed watershed model will simulate runoff caused by a rainfall event over the watershed. Runoff rate will be expressed in terms of volume per time by taking the depth of runoff over a particular area of the watershed, for a particular time period, and multiplying it by the area of the watershed that experiences that runoff. The watershed model will be calibrated to the runoff component of the flow in the stream, which will be determined using an accepted baseflow separation procedure. This runoff information will be "fed into" the hydrodynamic model so that the baseflow component of the flow may be simulated in the hydrodynamic model. In this way, the linked models will be accounting for the combined effects of runoff and baseflow for the basin discharge. |
| 3. The use of standard velocity-area methods (multiple measuring locations across the channel section at each designated station) for discharge calculations, such as: the TCEQ (1999) guidance for surface water flow measurement; ASTM standard methods D-4409, D-3858, D-5243; or USGS (1969), *etc*. In lieu of using standard stream discharge determinations, supporting discussion should be provided for any non-standard methodology. | Standard velocity-area methods will be used for discharge calculations. Flowpack software (Sontek/YSI, Inc.; http://www.sontek.com/product/sw/flowpack/flowpack.htm) was developed in association with Prof. Art Schmidt, Ph.D., P.E., from the University of Illinois. The Velocity-Indexing equations are in accordance with present USGS/ISO standards. |
| 4. The proposed modeling sampling design "…*assumes that existing sediment accumulations found in the bottoms of upstream drainages are representative of materials that are transported onto the Site during high flow events associated with runoff during rain storms in the are …*" (Sec 2.2.1, Subject report).<br><br>While the description of the origin of bayou sediment is likely accurate, it is also understood that significant contributions of *dissolved contaminants* to Patrick Bayou | The upstream source evaluation outlined in the Work Package 2 Work Plan is meant to provide an initial characterization of the upstream sediments only. The JDG understands that there may be sources of dissolved and particulate sources of contamination from other media, including groundwater. The approach for evaluations of different media will be developed in future Work Plans. |

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| sediments originate from local *affected groundwater discharging directly to those same bayou sediments*. This process is not acknowledged in the subject document. Failure to account for this contaminant mass flux to Patrick Bayou sediments may tend to invalidate the objective-driven conclusions of the modeling as proposed. | |
| Sec B Sample Design:<br>1. B.1 Continuous sampling of water parameters such as DO are to be taken continuously for nine (9) months (Sec 2.1.2.1, Subject Report). Please address the calibration schedule and methodology, if necessary, of the DO measurement instrument. | Continuous monitoring of DO will be performed using YSI's ROX™ Reliable Oxygen Sensor, a luminescent-based DO sensor that meets the requirements of ASTM International Method D888-05, Test Method C for dissolved oxygen measurement. Calibration checks will initially be performed approximately every 21 days until instrument performance is established. Once instrument performance has been established, based on the field team leader's professional judgment, the maintenance and calibration check interval may be extended to every 28 days. At no time will the scheduled maintenance and calibration check interval be extended beyond 35 days. Please see Section 5.2 and Table 9 for details on the calibration schedule and methods. |
| 2. The use of $^{137}Cs$ is proposed for determining the age of site sediments (Sec 2.3.1, Subject Report). While $^{137}Cs$ has a short half-life (~30 y) useful for age-dating in the sediment environment being considered, it is a fission product present in small quantities as atmospheric or "bomb" Cs. As such, it is likely to be in the shallow groundwater traveling up through the bayou sediments. (Sec A.4, this document, discusses groundwater relationship to sediments.)<br><br>The effects of such a process on the lower sediment could provide anomalous results and should be considered when evaluating the data. Additionally, a method by which the two | If the $^{137}Cs$ data from Work Package 2 evaluations do not provide an adequate amount of valid information concerning the depositional history and sedimentation rates for the Site as they pertain to the RI/FS, additional evaluations may be implemented to supplement those data. Potential techniques could include utilization of different isotopes such as $Be^{7}$ and $Pb^{210}$, utilization of marker horizons, and/or the use of sediment traps. |

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| potentially-competing processes can be discriminated in such an evaluation should be explored.<br><br>Briefly describe or reference the isotopic systematics of age-dating using $^{137}Cs$. | |
| **United States Environmental Protection Agency** | |
| 1. p 5, § 2.1.1.1, bullets: Define "rare/significant" rainfall event. Differentiate between "rare/significant" rainfall event and "high-flow" event. | One goal of the proposed continuous water sampling effort is to capture a range of high-flow events of varying magnitude in order to calibrate the hydrological (watershed) and hydrodynamic models. Because continuous flow monitoring has not previously occurred on Patrick Bayou over long periods, it was not possible for the team to perform a statistical analysis to determine the magnitude of flow events that are probable during the sampling period. As a result, we did not specify exact magnitudes (i.e., cfs exceedances) of these high-flow events. In addition, many times in Texas, rainfall can occur with little or no increased flow occurring in the streams because of obstructions on the land surface and infiltration. Consequently, it is also difficult to designate a specific rainfall depth that will ensure that a high-flow event has occurred (e.g., 1-inch event). Instead, we are proposing to administer the continuous sampling in an adaptive approach, where periodic updates on the events that have been captured can be provided to the team and, at the end of each bi-weekly period, we can assess whether a range of events have been captured and whether that range is adequate to ensure that sufficient data are available for model calibration. |
| 2. p 5, § 2.1.1.1.2: Explain/justify why only "rare/significant" events are being considered. Other events are likely to have influence, though probably not as much in the short-term. | As mentioned in the response to Comment 1 above, we are proposing to administer the continuous sampling in an adaptive approach, where periodic updates on the events that have been |

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| | captured can be provided to the team and, at the end of each bi-weekly period, we can assess whether a range of events have been captured and whether that range is adequate to ensure the models are calibrated for a range of discharge events. |
| 3. p 6, § 2.1.1.1.2, last , last sentence: "Current land use information…". The information source is listed as 2002. Significant changes/differences since 2002 should be investigated and accounted for. | We have spoken to the Houston-Galveston Area Council (HGAC) and are obtaining the most recent land use information they have available for the area. Based on our experience, the HGAC is the best source of information for land use in the Houston area. Our information indicates this land use information was developed within the last five years. Once we have received the information, we will review it and ensure its accuracy in representing current (2006) conditions. |
| 4. p 9, § 2.1.1.2, bullets: "five" primary tasks are mentioned, however, there are only 4 bullets. Is the 2nd bullet, comprising hydrologic and hydrodynamic models count as two tasks? | The text has been revised to show that there are four primary tasks. The hydrological and hydrodynamic modeling is considered one task. |
| 5. p 12, § 2.1.2.4.1, 2nd sentence: "It is expected that… 1 month." Although later sections state that this round of data collection will extend beyond 1 month if necessary, it is highly unlikely that 1 month is adequate. It is strongly recommended to allow sufficient time to pass between events such that baseline conditions return. Data from the second event would be misleading as flows, hydrodynamics, and sediment transport may still be occurring relating to the first event. In addition, this approach does not take into account seasonal variations (as suggested in the next section) which dramatically affect the magnitude and duration of high-flow events. | We agree with this concern and plan to extend the sampling program beyond 1 month if adequate high-flow events are not captured within the 1-month timeframe. The evaluation of an "adequate" event would include the consideration of whether conditions had returned to "baseline" after the occurrence of a previous high-flow event. As mentioned in the responses to Comments 1 and 2, we propose for this sampling to be adaptive and it will be extended until a full range of adequate events are captured. |
| 6. p 13, § 2.1.2.4.2, 1st sentence: "Data will be collected… 9- | The 9-month reference is a typo and will be corrected to 12- |

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| month period." The previous page stated "12 months". Please correct. | month. |
| 7. p 39, § 5.1.4: Explain/justify whether or not laboratory personnel will sieve sediments for the presence/removal of organisms, detritus and debris. Explain process for sediment sample homogenization if used. If sediment samples are not to be sieved or otherwise homogenized, explain how data may be affected and how such will be accounted for. | Samples will be homogenized in the field prior to placing in sample containers. Unrepresentative material will be removed prior to placing in sample containers. Please refer to Section 4.6.2 for detail on sample processing procedures. |
| **Texas Commission on Environmental Quality (September 18, 2006)** | |
| I have reviewed the subject document and my review comments are presented in this memo. This memo also reflects input from representatives of the TCEQ Region 12 office and NOAA (the National Oceanic and Atmospheric Administration). The Patrick Bayou Joint Defense Group (JDG) representatives are welcome to contact me if they have any questions regarding these comments.<br><br><u>General Comment</u><br>1. The plan seems reasonable and prudent in terms of the initial scope and density of sampling for the stated purposes. We expect that future more focused sampling will be needed based on the results of this effort. We do suggest, however, that another sample location be included in the sediment profiling plan that is close to the sample SE-23 (PB060). This sample location was where PCBs (polychlorinated biphenyls) were elevated (300,000 ppb) in the initial superfund sampling. That sample probably included deeper layers than some of the others, so a vertical profile of that area may yield some important information on the vertical distribution of PCBs in Patrick | An additional sampling location has been added to the Work Package 2 Work Plan to confirm or provide additional data regarding vertical PCB distribution in this area. Vertical characterization will be performed in a manner consistent with other cores described in the Work Plan; including PCB analysis as well as other target analytes. Please refer to revised Figure 5 and Table 4. The historic location SE-23 has been designated sample location PB063 in the Work Plan. |

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| Bayou. | |
| Specific Comments<br>2. 1.1 Site Description - Regarding the upstream source evaluation, there is a statement on page 3 that concentrations of several samples from areas outside of the site boundary south of Highway 225 have had high concentrations of PAHs (Polynuclear Aromatic Hydrocarbons) in past sampling events. The following comment (in part) on the PBSCR bears repeating: *Although higher total PAH values were found upstream of the site, the depiction in Figure 3-2 may be misleading. The distribution of the high molecular weight PAHs, (e.g. fluoranthene and chrysene) was very high upstream of the site. However, all the low molecular weight PAHs (specifically acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene), were not higher upstream of the site; they were lower upstream and were highest at stations Y and 3. Because the distributions are so different, the low and high molecular weight PAHs should be plotted and considered separately.* | The target PAH analyte list for all vertical characterization and upstream source evaluation samples will include low- and high-molecular weight PAHs. This will facilitate consideration of the distribution of these PAHs in future efforts of the RI. The distribution of PAHs and types of PAHs will be considered as part of the overall effort to characterize the Site. |
| 3. 2.1.1.2.1 Model Calibration - The discussion indicates that flow rates measured at sampling locations PB075 and EF008 (Figure 3) during the high-flow events will be compared to predicted flow rates due to watershed runoff, in order to calibrate the hydrologic model. There is no EF008 on Figure 3. Please clarify. | This is a typo, the referred figure should be Figure 2 and the station numbers are PB075 and EF005. |
| 4. 2.1.1.2.1 Model Calibration - Figure 3 (Hydrodynamic Data Requirements and Sample Locations) depicts a hydrodynamic station labeled PB020 at around PB023. Although the plotted location seems reasonable, station | Station PB020 was moved upstream into the more narrow section of the bayou to capture the higher velocities that would be expected in this part of the channel, as opposed to the wider section originally proposed. Please see revised Figure 3. |

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| PB020 seems too close to the island to get good current and flow information. We suggest that this station be moved up to PB023, or perhaps as far as PB028, to improve the accuracy of the flow information in this tidal bayou. | |
| 5. 2.1.2 Sample Design (2.1.2.1 Objectives of Field Study) - The proposal is to collect continuous measurements of surface water temperature, conductivity, elevation, and dissolved oxygen for a period of 9 months. In contrast, Section 2.1.2.4 states that water quality data collection will continue until 12 months of data are collected, so that seasonal information will be available. We believe that the 12-month data collection period is more appropriate. Hydrological data from the summer may be very different from the other seasons and may help explain some of the temporal differences observed between spring and summer sample results. | The 9-month reference is a typo. The water quality sampling of temperature, conductivity, elevation, and dissolved oxygen will occur over a 12-month period. |
| 6. 2.1.2.3 Data Collection - Total Suspended Solids (TSS) data will be collected at 3 locations in Patrick Bayou (every 3 hours for a month) to calibrate/validate the sediment transport model. Will this be integrated somehow with wastewater discharge TSS data to understand the influence of these sources, particularly during high flow events? | We will consider the wastewater TSS dischargers, if they have reported these values on the monthly Discharge Monitoring Reports (DMRs) for these locations and if the DMRs are readily available for review. However, it should be noted that in our experience, during a high-flow event, the TSS loading from point sources is relatively small in comparison to what is input from the land surface (i.e., non-point source pollution). Therefore, even if the DMRs are unavailable, it is expected that the dischargers' contributions during a high-flow event will be minimal. |
| 7. 2.1.2.4 Sample Frequency and Data Collection Periods (2.1.2.4.1 Hydrodynamic and Sediment Transport Model) - The discussion indicates that the initial data collection | The calibration of the hydrological (watershed) and hydrodynamic model will occur by adjusting model parameters within their acceptable ranges until the simulated velocities and |

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| period will continue until 3 high-flow events defined in this section have occurred. There is a statement later that the "data collection period may be extended on a bi-weekly basis, if the magnitude of rainfall events during the data collection period does not reflect a suitable range of conditions (as determined by the project technical team) for model calibration/verification." It is not clear what "high flow" events are targeted and why. Please clarify. Also, we believe that a 0.1-inch rainfall event is a relatively small rainfall event for this area. We suggest that the JDG attempt to get data resulting from a larger storm, such as a 0.5-inch or 1-inch event, to ensure that the model is not extrapolating higher events from very small events. | flow volumes agree with the measured velocities and volumes. One goal of the proposed continuous water sampling effort is to capture a range of high-flow events of varying magnitude in order to calibrate the hydrological (watershed) and hydrodynamic models for a range of rainfall/flow events. Because continuous flow monitoring has not previously occurred in Patrick Bayou over long periods, it was not possible for the team to perform a statistical analysis in order to determine the different magnitudes of flow events that are probable during the sampling period. As a result, we did not specify exact magnitudes (i.e., cfs exceedances) of these high-flow events. In addition, many times in Texas rainfall can occur with little or no increased flow seen in the streams because of abstractions on the land surface and infiltration. Consequently, it is also difficult to designate a specific rainfall depth that will ensure a high-flow event has occurred (e.g., 1-inch event). Instead, we are proposing to administer the continuous sampling in an adaptive approach, where periodic updates on the events that have been captured can be provided to the team and, at the end of each bi-weekly period, we can assess whether a range of events have been captured and whether that range is adequate to ensure the models are calibrated for a range of discharge events.<br><br>The 0.1-inch rainfall event criterion is meant only as a guideline for the field teams to use when deciding which samples to send back to the labs for TSS analysis. In no way is it intended to mean that the sampling effort is complete after capturing just three 0.1-inch events. Because of the issues with rainfall/runoff/high-flow event triggers discussed in the previous paragraph, the team is trying to be conservative by collecting as |

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| | much information as possible to aid in model development and calibration. Optimally, we hope to capture a range of events, but want to ensure that we capture *something* before the sampling effort is complete. |
| 8. 2.2 Upstream Source Characterization Data (2.2.1 Objectives and Rationale) - We suggest that mercury and PCB Aroclors should be included in the analyses for these 4 samples. Although concentrations of these chemicals have been low in previously collected upstream samples, there are potential sources of these contaminants in the upper watershed, and inclusion of these parameters will allow a more consistent evaluation of upstream sources. | Mercury and PCB Aroclors have been added to the target analyte list for upstream source characterization samples as suggested. Please refer to Table 2. |
| 9. 2.3.2.2 Sample Locations and Intervals - The Gahagan and Bryant (2005) reference was not included in the list of references. This reference should be added for completeness. | This reference was incorrect and should have referred to the Preliminary Site Characterization Report (Anchor 2006a). |
| 10. 2.3.2.3 Parameters for Analysis - See initial general comment regarding an additional sample location to evaluate potentially elevated PCB concentrations at depth. | Please see response to TCEQ general comment #1. |
| 11. 3.0 Laboratory Analytical Methods, Quality Control, and Measurement Quality objectives (page 20) - The text states that Table 4 (Parameters for Analysis and Target Practical Quantitation Limits for Sediment) includes the ER-M and TEL values for comparative assessment of the lab practical quantitation limits. However, Table 4 actually displays the ER-L and TEL values. The text on page 20 should be revised for consistency. The primary objective of the lab PQL should be to ensure that it is below the applicable ecological screening benchmark | The text has been revised for consistency to reflect the use of the ERL, which is the more conservative value of the two, for evaluating the PQL. |

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| values, to allow comparison to site media concentrations. | |
| 12. 4.6.2 Sediment Processing - If sediment samples will be analyzed for VOCs as a result of input to this work plan or others, these sediment samples should not be homogenized (as indicated on page 25). | Section 4.6.2 has been amended to included collection of VOC samples prior to homogenization or other sample processing steps. |
| Tables<br>13. Tables 2, 3, and 4 - Table 2 (Summary of Source Evaluation Sediment Sampling Study Design) refers to Table 4 (Parameters for Analysis and Target Practical Quantitation Limits for Sediment) for the complete list of the analytes to be included in the analyses. Table 4 includes mercury in the list of metals, whereas Table 3 (Summary of Vertical Characterization Sediment Sampling Study Design) lists mercury separately from the other metals. It is not clear from the tables if mercury is intended to be analyzed in the 4 source characterization samples. Also, we note that cadmium, chromium, and nickel are not proposed to be analyzed (Table 4). These 3 metals have been elevated in previous Patrick Bayou samples and should also be included in this characterization. | Mercury will be analyzed in the upstream source characterization. Table 2 has been modified to make this apparent. Several metals have been added to the target analyte list including cadmium, chromium, and nickel. Please refer to Table 4 for the complete list of target analytes. |
| 14. Table 3 - Radioisotope analysis for Cesium-137 will be performed on samples collected from 6 stations at specific intervals (4 cm sections every 32 cm), as denoted by "x"s in the table rows. To simplify the table, we suggest deleting the rows where Cesium-137 analyses are not planned. | The table has been simplified as suggested. |
| **Emailed Comment from who????** | |

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| Discuss the use of hydrologic models that seem to be pertinent to river system, but Patrick Bayou is more characteristic as a estuarine environment. Has EPA ever considered the use of WASP model to evaluate bayou conditions which seems more appropriate considering the site specific conditions of the Bayou. | The EPA WASP model is a water quality model that can simulate water quality components and tracers, such as toxics, nutrients, algal growth, and salinity. The hydrodynamic and hydrological components that are input to WASP are independent of the WASP model and are simulated using an external model. For example, the recent temperature model of the bayou that was developed and calibrated in light of a proposed temperature TMDL used DYNHYD to model the hydrodynamics and hydrology and WASP to model the heat balance/temperature. The hydrodynamic model that is proposed will be developed and calibrated to simulate circulation in the bayou during high-flow events, including the effects of tides. |